Lower North Fork Clearwater River Subbasin Assessment and TMDL

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Cover photo by Robert D. Henderson.

Table of Contents

List of Tables

List of Figures

List of Maps

List of Appendices

Abbreviations, Acronyms, and Symbols

303(d)	Refers to section 303 subsection (d) of the Clean Water Act, or a list of impaired water bodies required by this section
µ	micro, one-one thousandth
§	Section (usually a section of federal or state rules or statutes)
ADB	assessment database
AWS	agricultural water supply
CBAG	Clearwater Basin Advisory Group
BLM	United States Bureau of Land Management
BMPs	best management practices
BOD	biochemical oxygen demand
Btu	British thermal unit
BURP	Beneficial Use Reconnaissance Program
ºC	Celsius
CNF	Clearwater National Forest
CFR	Code of Federal Regulations (refers to citations in the federal administrative rules)
cfs	cubic feet per second
cm	centimeters
Cr.	Creek
CW	cold water
CWA	Clean Water Act
CWE	cumulative watershed effects
DEQ	Idaho Department of Environmental Quality
DO	dissolved oxygen
DWS	domestic water supply
EMAP	Environmental Monitoring and Assessment Program
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
ºF	Fahrenheit
FPA	Idaho Forest Practices Act
FWS	U.S. Fish and Wildlife Service
GIS	Geographical Information Systems
HUC	Hydrologic Unit Code
I.C.	Idaho Code
ICWB-Ave	Idaho Cold Water Aquatic Life - average
ISS-Ave	Idaho Salmonid Spawning - average
IDAPA	Refers to citations of Idaho administrative rules

IDFG Idaho Department of Fish and Game

IDL Idaho Department of Lands

IDWR Idaho Department of Water Resources

INFISH The federal Inland Native Fish Strategy

IRIS Integrated Risk Information System

km kilometer

km^2 square kilometer

LA load allocation

LC load capacity

LNFCRS Lower North Fork Clearwater River Subbasin

m meter

m^3 cubic meter

mi mile

mi^2 square miles

MBI macroinvertebrate index

MGD million gallons per day

mg/l milligrams per liter

mm millimeter

MOS margin of safety

MWMT maximum weekly maximum temperature

n.a. not applicable

NA not assessed

NB natural background

ND no data (data not available)

PCR primary contact recreation

ppm part(s) per million

NFS not fully supporting

NPDES National Pollutant Discharge Elimination System

NRCS Natural Resources Conservation Service

NTU nephlometric turbidity unit

ORV off-road vehicle

ORW Outstanding Resource Water

PACFISH The federal Pacific Anadromous Fish Strategy

PFC proper functioning condition

QA quality assurance

QC quality control

RBP rapid bioassessment protocol

SBA subbasin assessment

SCR secondary contact recreation

SFI DEQ's stream fish index

SHI DEQ's stream habitat index

SMI DEQ's stream macroinvertebrate index

SPZ Stream Protection Zone

SS salmonid spawning

SSOC stream segment of concern

TDS total dissolved solids

TMDL total maximum daily load

TP total phosphorus

TSS total suspended solids

U.S. United States

USC United States Code

USDA United States Department of Agriculture

USDI United States Department of the Interior

USFS United States Forest Service

USGS United States Geological Survey

WAG Watershed Advisory Group

WBAG *Water Body Assessment Guidance*

WBID water body identification number

WLA waste load allocation

WQLS water quality limited segment

WQS water quality standard

WWA Western Watershed Analysts

Executive Summary

The federal Clean Water Act (CWA) requires that states and tribes restore and maintain the chemical, physical, and biological integrity of the nation's waters (33 USC § 1251.101). States and tribes, pursuant to section 303 of the CWA are to adopt water quality standards necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the waters whenever possible. Section 303(d) of the CWA establishes requirements for states and tribes to identify and prioritize water bodies that are water quality limited (i.e., water bodies that do not meet water quality standards). States and tribes must periodically publish a priority list of impaired waters, currently every two years. For waters identified on this list, states and tribes must determine if a total maximum daily load (TMDL) for the pollutants, set at a level to achieve water quality standards, is necessary. This document addresses the water bodies in the Lower North Fork Clearwater River Subbasin (LNFCRS) that have been placed on what is known as the "303(d) list."

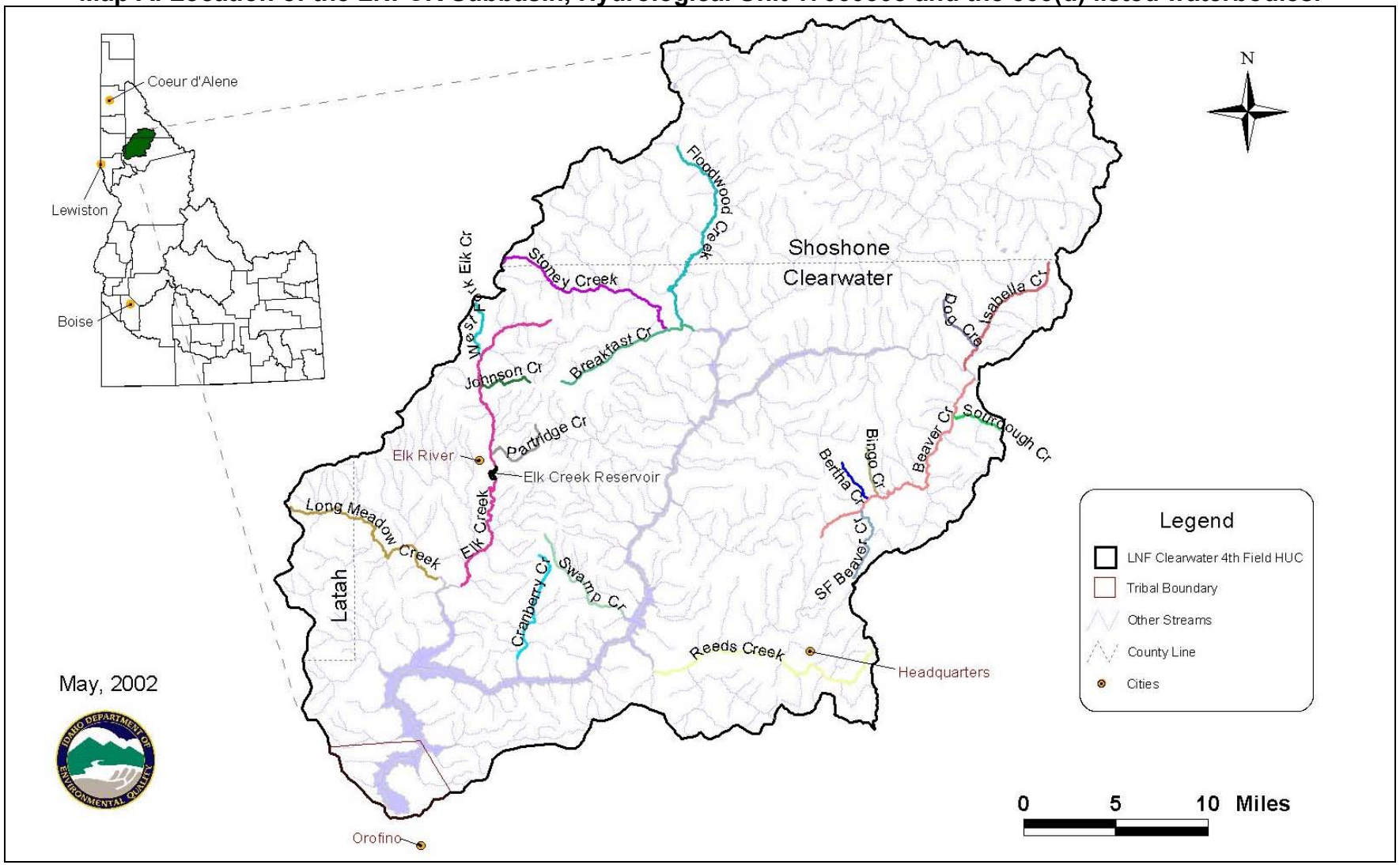
This subbasin assessment and TMDL analysis has been developed to comply with Idaho's TMDL schedule. This assessment describes the physical, biological, and cultural setting; water quality status; pollutant sources; and recent pollution control actions in the LNFCRS located in north central Idaho. The first part of this document, the subbasin assessment, is an important first step in leading to the TMDL. The starting point for this assessment was Idaho's current 303(d) list of water quality limited water bodies. Nineteen waterbodies in the LNFCRS were listed on this list. The subbasin assessment portion of this document examines the current status of 303(d)-listed waters, and determines if a waterbody is impaired, and if it is, the extent and cause(s) of impairment. The loading analysis quantifies pollutant sources and allocates responsibility for load reductions needed to return listed waters to a condition of meeting water quality standards.

Subbasin at a Glance

Map A displays the general location of the LNFCRS and the location of the 303(d)-listed waterbodies. The LNFCRS is 1,145.44 square miles, which is about the same size as the state of Rhode Island. The basin is located in north central Idaho, primarily in Clearwater County, situated around Dworshak Reservoir, with all streams flowing directly or indirectly into the reservoir. Dworshak Dam was completed in 1971, and the reservoir attained full pool two years later. At full pool the reservoir is 54 miles long, 2 miles across, and has a maximum depth of 480 feet. There is no passage for migrating fish at Dworshak Dam.

Elevations range from 1,445 feet, which is minimum pool elevation of Dworshak Reservoir, to over 7,000 feet. Most elevations are within 3,000 feet to 5,500 feet and a large majority of the topography is of steep terrain with greater than 50% slope gradients. The streams in the basin have a pattern of low flows during the late summer and early fall months and high flows in the spring and early summer months. Over the past 100 years human activities, primarily silvercultural, have changed the landscape of the basin to a degree and these alterations are the primary reason TMDLs were developed for the LNFCRS.

Map A. Location of the LNFCR Subbasin, Hydrological Unit 17060308 and the 303(d) listed waterbodies.



The LNFCRS is a very sparsely populated area with only one incorporated city, Elk River, with a population of 156 people (Idaho Department of Commerce 2002). The total population in the LNFCRS is estimated at 300 people with a density of 0.262 people per square mile. Forestry and recreational activities dominate the land use of the basin, with some grazing occurring in the southern and central parts of the basin. Cattle are typically brought into these areas around June and then removed in October or early November. Federal and state governmental agencies and timber companies, primarily Potlatch Corporation, own 95% of the basin. The basin is nearly 100% forested; hence, most of the management of non-federal lands is for timber harvest. While timber harvesting has significantly decreased on the Clearwater National Forest (CNF), timber harvesting has been the primary land use in the LNFCRS and will continue to be, as Potlatch Corporation and the Idaho Department of Lands (IDL) still harvest several hundred million board feet of timber each year. The LNFCRS is also a popular destination for outdoor recreation activities such as hunting, fishing, hiking, boating, and camping.

Within the LNFCRS (HUC #17060308) there are 19 waterbodies on the 1998 303(d) list: Beaver Creek, South Fork Beaver Creek, Bertha Creek, Bingo Creek, Breakfast Creek, Cranberry Creek, Dog Creek, Elk Creek, West Fork Elk Creek, Elk Creek Reservoir, Floodwood Creek, Isabella Creek, Johnson Creek, Long Meadow Creek, Partridge Creek, Reeds Creek, Sourdough Creek, Stony Creek, and Swamp Creek. Most of these streams are listed because they did not meet CNF Plan Sediment Standards (CNF 1992) or because they were listed as impaired in *The 1992 Idaho Water Quality Status Report*, Appendix D (DEQ 1992) as being impaired. When these waterbodies were placed on the original 303(d) list in 1994, there was a very limited amount of data to support their listing, if any at all. These waterbodies were placed on the 303(d) list because of "evaluated" information, meaning best professional judgment was used at the time. Since then, sufficient data has been collected to properly assess these waterbodies. Map B shows the watershed boundaries of all 303(d)-listed streams and their geographical locations within the LNFCRS.

Map B. Geographical Location of the 303(d)-listed waterbodies and watersheds.

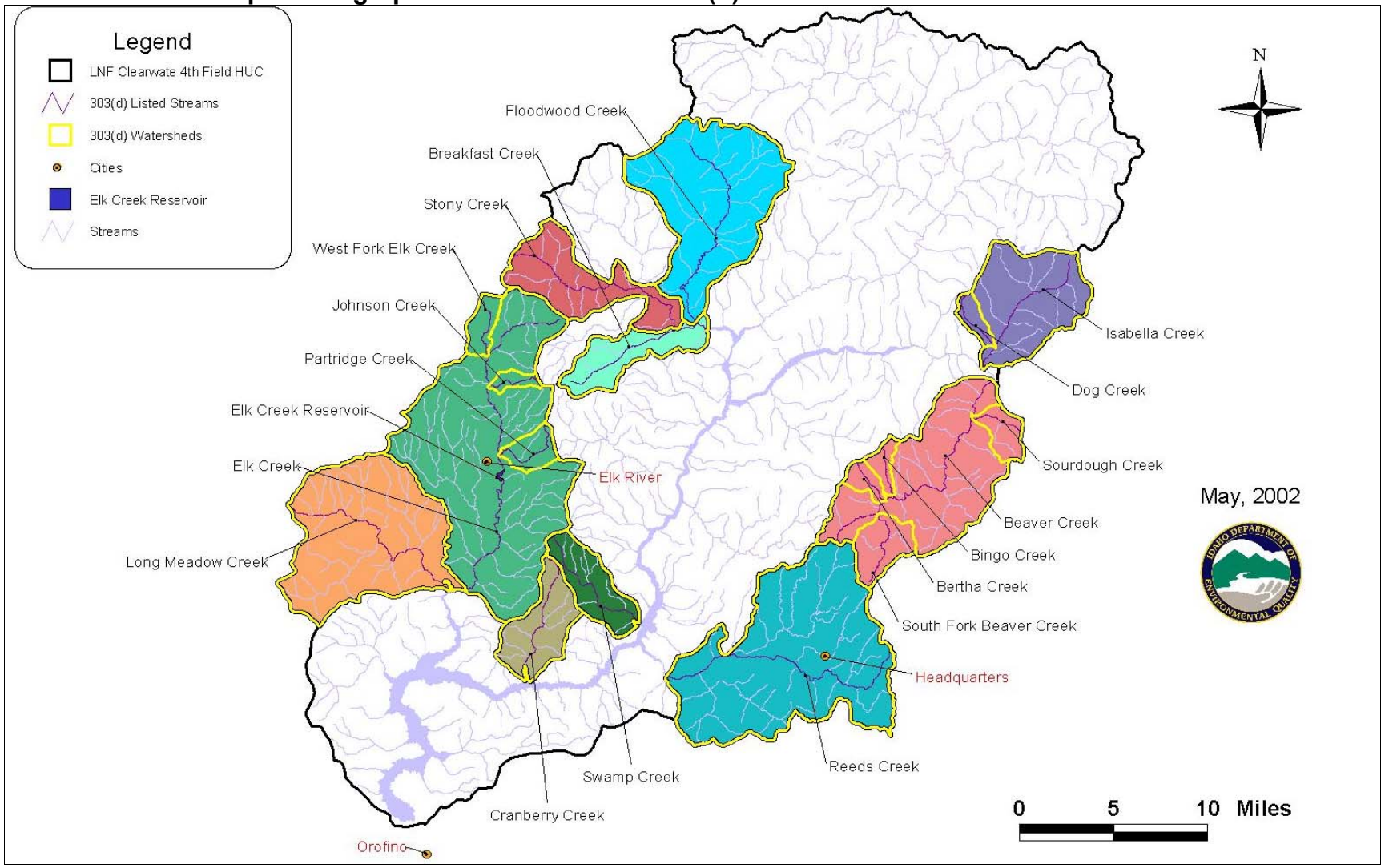


Table A displays the waterbodies for which TMDLs were written and their pollutants of concern. All the streams have salmonid spawning, aquatic cold water, and primary contact recreation or secondary contact recreation as existing or designated beneficial uses. The majority of the information used to determine the level of impairment was from the CNF, IDL, and the Idaho Department of Environmental Quality (DEQ). Based on existing information and data, a monitoring plan was developed to fill in the data gaps. Once all the data were in place, an analysis was completed on each of the 303(d) waterbodies. After the analysis, six sediment, four temperature, and two bacteria TMDLs were written. The pollutants in the LNFCRS are mainly from nonpoint sources, as the only point source is the wastewater treatment plant in Elk River. For sediment, the main sources are background, roads, mass failures, and streambank and riparian area erosion. For bacteria, the main sources are cattle and other livestock, wildlife, and humans. For temperature, the source is solar radiation. Nutrients and dissolved oxygen (DO) were also listed as pollutants of concern on the 1998 303(d) list (DEQ 1999); however, after analyzing the data, these pollutants were determined to not be impairing any beneficial uses. Desired conditions in other watersheds were used to determine the loading capacities for the sediment TMDLs, which are based on the state sediment standards. The loading capacity for the temperature TMDLs was based on the state standards and the Cumulative Watershed Effects (CWE) temperature analysis model. The loading capacity for the bacteria TMDLs was based on state numeric standards.

Table A. Streams and pollutants for which TMDLs were developed.

Stream (Creek)	Pollutant(s)
Breakfast	Sediment
Cranberry	Sediment, Temperature, Bacteria
Elk-lower	Temperature
Long Meadow	Sediment, Temperature, Bacteria
Partridge	Sediment
Reeds	Sediment
Swamp	Sediment, Temperature

Key Findings

The subbasin assessment was written for the entire LNFCRS; however, only the 19 listed waterbodies were intensively evaluated. Thereby, TMDLs were only considered for the listed pollutants on the 19 listed waterbodies. Twelve TMDLs were written for seven different waterbodies for three separate pollutants, while seven waterbodies are recommended for 303(d) listing for temperature. These decisions were based on data collected specifically by DEQ and/or from existing data from other agencies and entities including IDL, CNF, the Idaho Department of Fish and Game (IDFG), and Potlatch Corporation.

Sediment

Sediment TMDLs were written for six waterbodies impaired by excessive sediment. In each of these waterbodies, the beneficial uses of salmonid spawning and cold water biota are not being fully supported. For each sediment TMDL, a numeric target was calculated and a narrative target based on the state standards was also written. Various desired conditions from other watersheds were used to determine the sediment load capacities. In the Breakfast Creek, Cranberry Creek, Long Meadow Creek, Reeds Creek, and Swamp Creek watersheds, roads were the primary source of sediment. In the Partridge Creek watershed, bank and riparian area erosion is the primary source of sediment. Each numeric target for sediment is summarized in Table B. The load allocation is the total amount of sediment allowed in the waterbody in tons per year from all sources. The load allocation ensures water quality standards (IDAPA 58.01.02) and existing beneficial uses are met. The load reduction is the amount of sediment from all sources that will need be reduced in order to meet the load allocation. Seasonal variation was considered for the sediment TMDLs. These TMDLs are broken into sources: natural background, roads, mass failures and in-stream erosion. The sediment load amounts from natural background and roads are based on a yearly cycle with the majority of the erosion occurring during the high precipitation events, typically the spring (Table B-3). The sediment load from mass failures is based on a fifteen-year cycle and converted to a yearly amount. The sediment load from in-stream erosion is calculated to a yearly rate, which accounts for seasonal variation activities like grazing and ATV usage. Five years is the estimated time needed to meet the load reduction and load allocation limits. Five years was used mainly due to the Cumulative Watershed Effects (CWE) monitoring cycle. Under the Forest Protection Act (FPA) guidelines, CWE will have to be conducted in these watersheds again. Five years also gives DEQ time to re-monitor the impaired waterbodies. Due to the large size of Reeds Creek, load allocations and reductions were calculated and specified for five sub-watersheds within the Reeds Creek watershed. Margins of safety (MOS) were built into each sediment load allocation calculation. Collection of sediment data occurred in the summer to early fall as most of the LNFCRS is covered with snow during the winter months. A narrative target of sediment not to exceed a level that will impair the beneficial uses will be met when additional data is collected and macroinvertebrate, fish and habitat conditions improve to the point where each stream is meeting the beneficial uses and is within state standards. If the numeric load reductions mentioned in Table B do not allow the narrative targets to be achieved, further sediment reductions may be necessary.

Table B. Sediment load allocations and reductions for the LNFCRS.

Watershed (Creek)	Source	Current Load (tons/yr)	Load Allocation (tons/yr)	Load Reduction (tons/yr)
Breakfast	Roads	830	434	396
Breakfast	Mass Failures	373	75	298
Cranberry	Roads	218	161.5	56.5
Cranberry	Mass Failures	5	1.5	3.5
Cranberry	Bank Erosion	50	25	25
Long Meadow	Roads	2365	674	1691
Long Meadow	Mass Failures	268	27	241
Long Meadow	Bank Erosion	370	185	185
Partridge	Roads	13.8	13.5	0.3
Partridge	Bank Erosion	195	97.5	97.5
Reeds-SW[1]	Roads	328	109	219
Reeds-SW	Mass Failures	58	5	53
Reeds-HW[2]	Roads	506	455	51
Reeds-HW	Mass Failures	327	163.5	163.5
Reeds-NF[3]	Roads	205	184	21
Reeds-NF	Mass Failures	1.0	0.5	0.5
Reeds-Alder[4]	Roads	727	567	160
Reeds-Alder	Mass Failures	75	37.5	37.5
Reeds-GS[5]	Roads	807	484	323
Reeds-GS	Mass Failures	3.0	1.5	1.5
Swamp	Roads	417	161	256
Swamp	Mass Failures	17	2.3	14.7
Swamp	Bank Erosion	65	32.5	32.5

[1] SW=Sidewalls(near the mouth)
[2] HW=Headwaters
[3] NF=North Fork of Reeds Creek
[4] Alder=Alder Creek portion of Reeds Creek
[5] GS=Gold and Snake Creek portions of Reeds Creek

Temperature

Temperature TMDLs were written for four waterbodies that are impaired by temperature. In these four waterbodies, the beneficial uses of salmonid spawning and/or cold water biota are not being fully supported. For each temperature TMDL, a numeric target was calculated and a surrogate shade percentage target over the streams was developed. Stream temperatures are

directly related to air temperatures, and in a forested environment, air temperatures and stream shading are the major environmental factors influencing 90% of the variability in stream temperature (Brown 1971, IDL 2000[b]). For each temperature TMDL, a numeric load allocation in watts per square meter and a percent reduction were calculated. The load allocations and percent reductions are based on the CWE temperature model, which uses stream shading to determine shade targets. Most of these surrogate shade targets are at 100% cover or the maximum cover achievable; therefore, an MOS is implicit. The critical time frame for these TMDLs is May through September depending on the species present in each particular waterbody. The numeric temperature target will be the state salmonid spawning criteria; however, if the temperature of the stream exceeds state standards, and it is determined that the temperature is a natural condition, the natural condition will become the state standard. Significant changes will have to occur to reach natural conditions in the stream riparian areas of Cranberry Creek, Elk Creek-lower, Long Meadow Creek, and Swamp Creek. Elk Creek-lower is going to require special attention as water entering this stream from Elk Creek Reservoir is about 5 ºC warmer in the summer than it would be if the reservoir were not there. An approximate load allocation of 5ºC for the months of May through September has been applied to Elk Creek Reservoir.

Bacteria

Bacteria TMDLs were written for Cranberry Creek and Long Meadow Creek. In these two waterbodies, the beneficial use of secondary contact recreation (SCR) is not being fully supported. The three main sources of bacteria are cattle, wildlife, and humans. The numeric target will be the state standard of 126 *E. coli* organisms per 100 ml. A 10% MOS was included in the load allocation and reduction calculations and is shown in Table C below. The critical time frame for the bacteria TMDLs is May through November. That is when cattle are present and typically when the SCR beneficial use is being protected.

Table C. Bacteria load allocations and reductions for the LNFCRS.

Watershed (Creek)	**Source**	**Current Load** (*E.coli* organisms/ day)	**Load Allocation** (*E.coli* organisms/ day)	**MOS** (10%) (*E.coli* organisms/ day)	**Load Reduction** (*E.coli* organisms/ day)
Cranberry	Cattle, wildlife, humans (CR2)[1]	7.4×10^{10}	5.1×10^{10}	2.3×10^{9}	2.5×10^{10}
Long Meadow	Cattle, wildlife, humans (LM2)[2]	2.5×10^{12}	5.5×10^{11}	1.9×10^{10}	2.1×10^{12}
Long Meadow	Cattle, wildlife, humans (LM4)[3]	3.2×10^{11}	1.2×10^{11}	2.0×10^{10}	2.2×10^{11}

[1] CR2 = Cranberry Creek monitoring site number 2
[2] LM2 = Long Meadow Creek monitoring site number 2
[3] LM4 =Long Meadow Creek monitoring site number 4

Table D shows the proposed outcomes for all nineteen listed waterbodies. It includes recommended changes to the 303(d) list. All recommendations are based on the most current and best data and data analysis available to DEQ.

Table D. Summary of assessment outcomes.

Waterbody Segment (Creek)	Pollutant	TMDL(s) Completed	Recommended Changes to 303(d) List	Justification
Beaver	Sed[1]	No	Remove Sed; Add Temp[2]	Data
Beaver - SF	Sed	No	Remove Sed	Data
Bertha	Sed	No	Remove Sed	Data
Bingo	Sed	No	Remove Sed; Add Temp	Data
Breakfast	Sed, DO[3]	Yes-Sed	Remove DO; Add Temp	Data
Cranberry	Sed, Temp, Bact[4], Nut[5]	Yes-Sed, Bact, Temp	Remove Nut	Data
Dog	Sed	No	Remove Sed	Data
Elk - lower	Sed, Temp, Bact, Nut	Yes-Temp	Remove Sed, Bact, Nut	Data
Elk - upper	Sed, Temp, Bact, Nut	No	Remove Sed, Temp, Bact, Nut	Data
Elk Creek Reservoir	Sed, Temp, Bact, Nut, DO	No	Remove Sed, Temp, Bact, Nut, DO	Data
Elk - WF	Sed	No	Remove Sed	Data
Floodwood	Sed, DO	No	Remove Sed, DO; Add Temp	Data
Isabella	Sed	No	Remove Sed; Add Temp	Data
Johnson	Sed	No	Remove Sed	Data
Long Meadow	Sed, Temp, Nut, Bact	Yes-Sed, Temp, Bact	Remove Nut	Data
Partridge	Sed	Yes-Sed	None	Data
Reeds	Sed	Yes-Sed	Add Temp	Data
Sourdough	Sed	No	Remove Sed	Data
Stony	Sed, DO	No	Remove Sed, DO; Add Temp	Data
Swamp	Sed, Temp, Nut, Bact	Yes-Sed, Temp	Remove Nut, Bact	Data

[1] Sed = Sediment
[2] Temp = Temperature
[3] DO = Dissolved oxygen
[4] BACT = Bacteria
[5] Nut = Nutrients

Public Input and Meetings

A public meeting was held in January 2002 to solicit citizen participation. A news release, advertisements in three local newspapers, a radio public service announcement, and an advertisement on the DEQ web site were all coordinated for the January meeting. Nearly 30 individuals were in attendance representing a variety of interests. A Watershed Advisory Group (WAG) for the LNFCRS was officially formed a few months later, and meetings have been occurring almost monthly since then. There are 25 members of the WAG, and many other people are involved and on a mailing list. Membership on the WAG includes citizens at large, landowners in the basin, Potlatch Corporation, CNF, IDL, the Nez Perce Tribe, environmental interests, and representatives from local government. The WAG has reviewed two different draft versions of this document. The WAG submitted informal comments to DEQ, which were incorporated in the final document. This informal comment process gave all the WAG members an opportunity to add significant input to the document. Several WAG members indicated they thought the informal comments were a very useful and productive format for public input. The WAG's involvement with the TMDL process and this document has been instrumental, and they should be commended for their efforts. A public meeting was held in Orofino on October 10 2002 (during the 30-day formal comment period) as part of the Clearwater Basin Advisory Group (CBAG) October meeting. Approximately 50 formal comments were received from four different commentators.